

DATA SHEET

FM1236

Desktop video & FM radio module
system M, N

Preliminary specification
File under BU Tuners, DC03

1997 Feb 03

Desktop video & FM radio module system M, N

FM1236

FEATURES

- System M and N, and FM radio broadcast
- True 5 V device (low power dissipation)
- Full frequency range from channel 2 (55.25 MHz) to channel 69 (801.25 MHz)
- FM band coverage from 76.0 MHz to 108.0 MHz
- PLL controlled tuning
- Programmable PLL step size (31.25, 50 or 62.5 kHz)
- True-synchronous vision IF demodulator (PLL)
- Ultra linear FM PLL demodulator for FM broadcast
- Demodulated video output, AF sound output, second sound IF output
- I²C-bus control of tuning, address selection, AFC status information
- Complies with FCC, DOC and JIS regulations on radiation
- Small horizontally mounted metal housing.

DESCRIPTION

The FM1236 front-end is designed to receive both TV and FM stereo signals in the PC Multimedia environment. The units are available with separate 75 Ω inputs for TV and FM broadcast reception. The input connectors available are either standard phono or F type. The tuning, bandswitching and antenna selection are made through the I²C bus.

The front-end covers the TV bands from 55.25 MHz to 801.25 MHz, inclusive of the Japanese TV bands from 91.25 MHz to 765.25 MHz. The FM band covers the standard 87.50 MHz to 108.00 MHz and also the Japanese FM band (76.00 MHz to 91.00 MHz). An RDS decoder can be connected to the AF-MPX output. The FM1236 meets the input immunity and radiation requirements of the FCC, DOC and JIS.

The FM1236 consists of a TV tuner, an FM radio tuner and an IF section, all designed on a single PCB. The front-end is assembled in a metal housing made of a rectangular tin-plated steel frame, with front and rear covers, which have soldered contacts to the frame. The two phono or F antenna connectors (female) are mounted on one side of the frame for the TV/FM signal inputs. All other connections are made via pins at the bottom.

The TV IF section uses an intercarrier SAW filter, followed by a true-synchronous vision IF demodulator (PLL) IC. The analog AFC voltage is fed to the 5-level A/D converter in



the PLL tuning IC, so that the AFC status can be read via the I²C-bus.

In the FM radio mode, the level detector and AFT functions are provided for the auto-search routines. The level detector and AFT status can be read from the A/D bits in the status-byte. The mute function is also provided to suppress the audio output signal, if required.

The tuner AGC for both TV and FM radio operation, is generated with a novel AGC detector which measures the IF signal level directly at the tuner IF output terminals. As opposed to the conventional AGC detector, this new circuit allows a higher take-over level and offers superior immunity against tuner overload.

The demodulation of the TV sound (4.5 MHz) and FM IF (10.70 MHz) is done with a PLL demodulation circuit contained in the IF IC. In the FM radio mode, the multiplexed AF signal is then channelled to a stereo decoder IC which extracts the left/right analog signals. The multiplexed audio signal is also available at pin 25 to support RDS or BTSC implementations. The 2nd IF sound output is provided to connect external (analog 2 carrier or digital) stereo processing.

ORDERING INFORMATION

| TYPE | DESCRIPTION | CATALOGUE NUMBERS |
|--------------|----------------|-------------------|
| FM1236/HM/PH | standard phono | 3139 147 13411 |
| FM1236/HM/F | F | 3139 147 13421 |

MARKING

The following items of information are printed on a sticker that is on the top cover of the tuner:

- Type number
- Code number
- Origin letter of factory
- Change code
- Year and week code.

Desktop video & FM radio module system M, N

FM1236

INTERMEDIATE FREQUENCIES

| SYSTEM | FREQUENCY (MHz) |
|-----------------|-----------------|
| Picture carrier | 45.75 |
| Colour | 42.17 |
| Sound | 41.25 |
| FM | 10.70 |

CHANNEL COVERAGE

| BAND | OFF-AIR CHANNELS | | CABLE CHANNELS | |
|-----------|------------------|------------------|---------------------|------------------|
| | CHANNEL | FREQUENCY (MHz) | CHANNEL | FREQUENCY (MHz) |
| FM band | – | 76.00 to 108.00 | – | – |
| Low band | 2 to 6 | 55.25 to 83.25 | A-2 to G | 109.25 to 157.25 |
| Mid band | 7 to 13 | 175.25 to 211.25 | H to I | 163.25 to 169.25 |
| | | | J to ZZ | 217.25 to 451.25 |
| High band | 14 to 69 | 471.25 to 801.25 | AAA to BBB (+6 MHz) | 457.25 to 469.26 |

PINNING

| SYMBOL | PIN | DESCRIPTION |
|------------------------|-----------------------|---|
| V _T | 11 | tuning voltage (monitor) |
| V _{S(tuner)} | 12 | supply voltage tuner section +5 V |
| SCL | 13 | I ² C-bus serial clock |
| SDA | 14 | I ² C-bus serial data |
| AS | 15 | I ² C-bus address select |
| AF O/P right | 20 | FM right channel |
| AF O/P left | 21 | FM left channel |
| 2 nd IF O/P | 22 | second IF sound output |
| CVBS | 23 | Composite Video Baseband Signal (CVBS) output |
| V _{S(IF)} | 24 | supply voltage IF section +5 V |
| AF O/P | 25 | AF sound output |
| – | TH1, TH2, TH3 and TH4 | mounting tags (ground) |

Desktop video & FM radio module system M, N

FM1236

BLOCK DIAGRAM

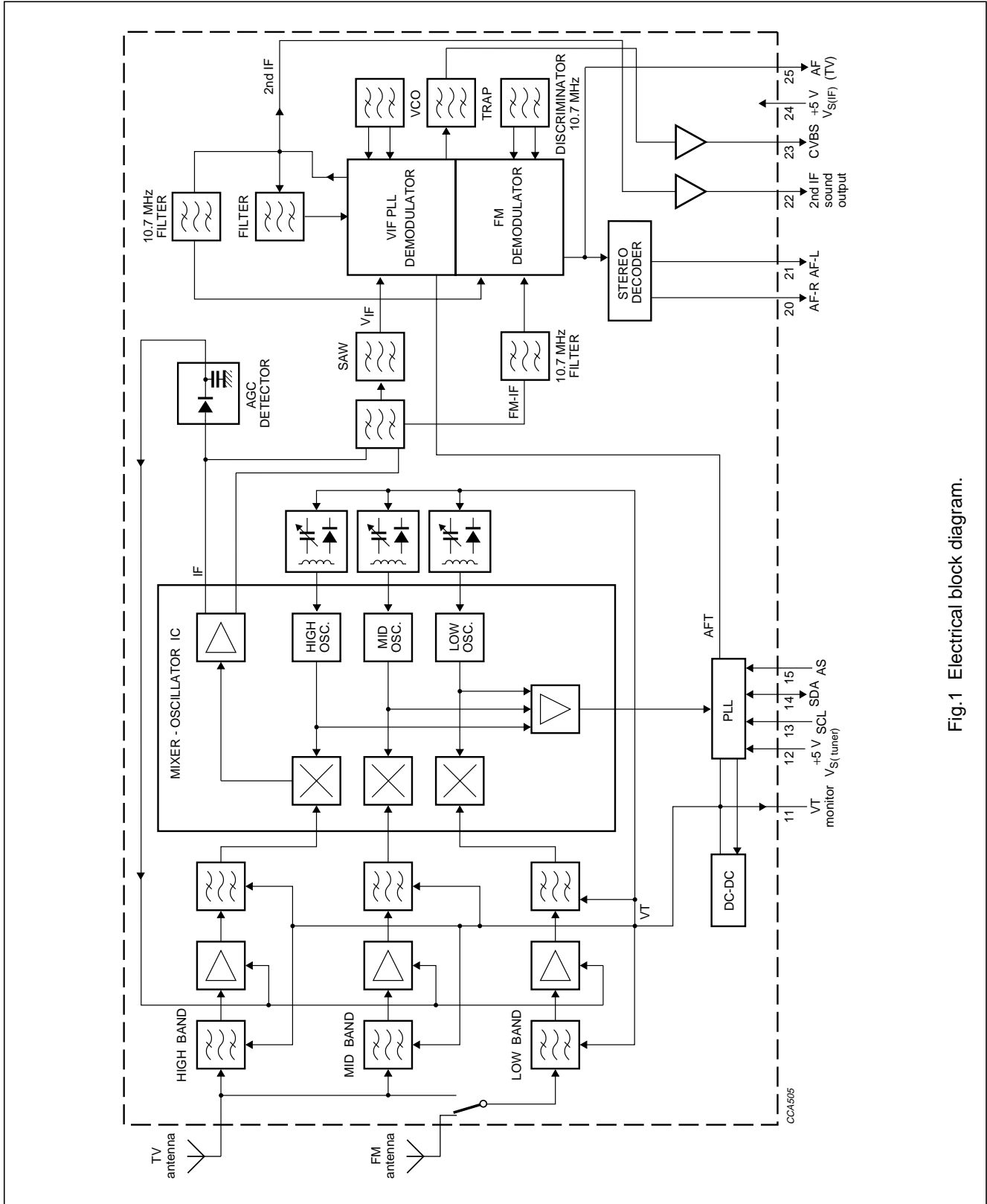


Fig.1 Electrical block diagram.

Desktop video & FM radio module system M, N

FM1236

LIMITING VALUES

Limiting values under operational conditions

The tuner can be guaranteed to function properly under the following conditions.

| SYMBOL | PARAMETER | PIN | MIN. | TYP. | MAX. | UNIT |
|------------------------|---|-----|------|------|-------|------------|
| V_S | supply voltage | 12 | 4.75 | 5.00 | 5.25 | V |
| $V_{S(\text{ripple})}$ | peak-to-peak ripple voltage susceptibility (at 5 V $\pm 5\%$); note 1: 20 Hz to 100 kHz >100 kHz to 500 kHz | | – | – | 5 | mV |
| | | | – | – | 10 | mV |
| $I_{S(\text{tuner})}$ | supply current | | – | – | 120 | mA |
| V_{SCL} | SCL bus input voltage | 13 | –0.3 | – | +5.25 | V |
| V_{SDA} | SDA bus input voltage | 14 | –0.3 | – | +5.25 | V |
| I_{SDA} | SDA bus current (open collector) | | –1 | – | +5 | mA |
| V_{AS} | address select voltage; note 2 | 15 | – | – | +5.25 | V |
| $V_{AFright(FM)}$ | FM right channel DC voltage | 20 | – | 1.0 | – | V |
| $Z_{AFright(FM)}$ | FM right channel load impedance parallel connected: resistive value capacitive value | | – | 40 | – | k Ω |
| | | | – | 9 | – | pF |
| $V_{AFleft(FM)}$ | FM left channel DC voltage | 21 | – | 1.0 | – | V |
| $Z_{AFleft(FM)}$ | FM left channel load impedance: resistive value capacitive value | | – | 40 | – | k Ω |
| | | | – | 9 | – | pF |
| Z_{IF} | 2 nd IF sound output load impedance | 22 | 0.5 | – | – | k Ω |
| Z_{CVBS} | Composite Video Baseband Signal load impedance | 23 | – | 75 | – | Ω |
| t_L | CVBS load time constant | | – | – | 100 | ns |
| $V_{S(IF)}$ | IF supply voltage | 24 | 4.75 | 5.0 | 5.25 | V |
| $I_{S(IF)}$ | IF supply current | | – | – | 150 | mA |
| Z_{AF} | AF sound output load impedance parallel connected: resistive value capacitive value | 25 | 5.0 | – | – | k Ω |
| | | | – | – | 4 | nF |

Notes

1. Sinusoidal ripple voltage superimposed on the 5 V supply voltage in the frequency range of 20 Hz to 500 kHz. Criteria for TV interference >57 dB.
2. For detailed information about the address decoding, refer to Chapter "Application information".

Desktop video & FM radio module system M, N

FM1236

Environmental conditions

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------------------------------|---------------------|-------------|------|------|------|------------------|
| Non-operational conditions | | | | | | |
| T _{amb} | ambient temperature | | -25 | - | +85 | °C |
| RH | relative humidity | | - | - | 100 | % |
| g _B | bump acceleration | 25 g | - | - | 245 | m/s ² |
| g _S | shock acceleration | 50 g | - | - | 490 | m/s ² |
| | vibration amplitude | 10 to 55 Hz | - | 0.35 | - | mm |
| Operational conditions | | | | | | |
| T _{amb} | ambient temperature | | -10 | - | +60 | °C |
| RH | relative humidity | | - | - | 95 | % |

OVERALL PERFORMANCE

Conditional data

Unless otherwise specified, all electrical values for Chapter "Overall performance" apply at the following conditions.

| SYMBOL | PARAMETER | VALUE | UNIT |
|--------------------|---|----------|--------|
| T _{amb} | ambient temperature | 25 ±5 | °C |
| RH | relative humidity | 60 ±15 | % |
| V _S | supply voltage (tuner and IF section) | 5 ±0.125 | V |
| Z _{CVBS} | video output load impedance (DC) | 75 | Ω |
| Z _{IF} | 2 nd IF sound output load impedance (DC) | 0.5 | kΩ |
| Z _{AF} | AF sound output load impedance | 100 | kΩ |
| t _{pr} | pre-heating time (+5 V at pin 24) | 10 | minute |
| Z _{S(AE)} | aerial source impedance (asymmetrical) | 75 | Ω |

Desktop video & FM radio module system M, N

FM1236

TUNER CHARACTERISTICS

For detailed information about the PLL programming, refer to Chapter "Application information".

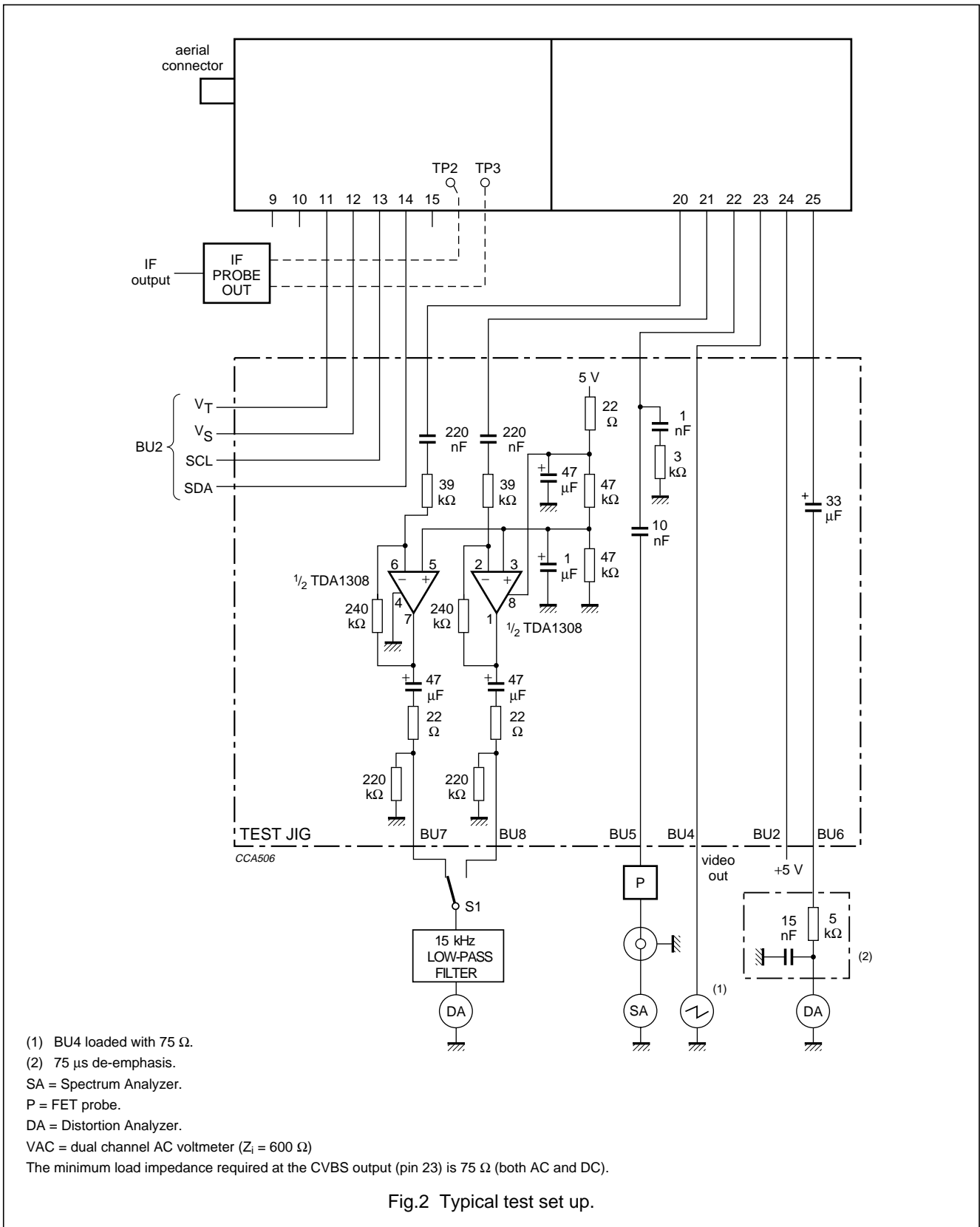
The desktop video tuner is guaranteed to function properly within the specified operational conditions, but a certain deterioration of performance parameters may occur at the limits of the operational conditions.

Required data for test equipment to be used

| EQUIPMENT | PARAMETER | VALUE | UNIT |
|-------------------|---|-----------|------------------|
| DC voltmeter | input impedance | >1 | M Ω |
| Oscilloscope | input impedance: resistance capacitance | >1 <15 | M Ω pF |
| Spectrum analyzer | input impedance | 50 | Ω |
| FET probe | input impedance: resistance capacitance | 1 3.5 | M Ω pF |
| | output impedance | 50 | Ω |
| | voltage gain | 0 | dB |
| | | | |
| AC millivoltmeter | input impedance | >100 | k Ω |

Desktop video & FM radio module system M, N

FM1236



Desktop video & FM radio module system M, N

FM1236

Definitions of test signals (see Fig.2)

| TEST SIGNAL | FREQ. (MHz) | AMPLITUDE | MODULATION | |
|---|-------------------|--------------------------|---|--|
| | | | VIDEO | AUDIO |
| A0: unmodulated vision carrier | 477.25 | 60 dB μ V | | |
| A1: RF M, N standard signal with video modulation | 477.25 | 60 dB μ V (top sync) | 100% (rest carrier 12.5%) 2T pulse and bar | |
| B1: unmodulated sound carrier M, N system | 481.25 | -7 dB w.r.t. A0 to A1 | | |
| B2: FM modulated sound carrier M, N system | 481.25 | -7 dB w.r.t. A0 to A1 | | 1 kHz; modulation frequency deviation ± 25 kHz; 75 μ s pre-emphasis |
| B3: unmodulated sound carrier M, N system | 483.25 | -12 dB w.r.t. A0 to A1 | | |
| C1: FM modulated sound carrier | 98.00 | 60 dB μ V | | 1 kHz; modulation frequency deviation ± 22.5 kHz |
| C2: FM modulated sound carrier | 97.70 or 98.30 | 60 dB μ V | | 1 kHz; modulation frequency deviation ± 22.5 kHz |
| C3: FM modulated sound carrier | 98.00 | 60 dB μ V | | 1 kHz; modulation frequency deviation ± 75 kHz; 10% pilot carrier (L = R); 75 μ s pre-emphasis |

Aerial input characteristics

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------------|--|--|------|--------|------------|
| V _{SWR} | reflection coefficient | referred to 75 Ω impedance (worst case on or between picture and sound carrier at maximum gain): all channels in TV mode FM (centre of channel) | - | 5 4 | |
| V _{PSM} | surge protection voltage | | 5 | - | kV |
| V _{ant} | antenna connection disturbance voltage | 1 to <54 MHz | - | 10 | dB μ V |
| | | 54 to <300 MHz | - | 34 | dB μ V |
| | | 300 to <1000 MHz | - | 50 | dB μ V |

Desktop video & FM radio module system M, N

FM1236

General characteristics

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------------------|---|----------------------------|--------|------|------------|------------|
| f_b | frequency range: | | | | | |
| | FM band | | 76.00 | – | 108.00 | MHz |
| | low band | | 55.25 | – | 157.25 | MHz |
| | mid band | | 163.25 | – | 451.25 | MHz |
| | high band | | 457.25 | – | 801.25 | MHz |
| Δf_b | margin: | | | | | |
| | for FM band | | 3 | – | – | MHz |
| | for low band | | 1.5 | – | – | MHz |
| | for mid/high band | | 3 | – | – | MHz |
| α_i | image rejection (nominal gain to 10 dB gain reduction): | | | | | |
| | low band (channel 2 to 6) | | 60 | – | – | dB |
| | mid band (channel 7 to 13) | | 60 | – | – | dB |
| | high band (channel 14 to 69) | | 45 | – | – | dB |
| α_{IF} | IF rejection (picture) | | 60 | – | – | dB |
| Z_{IF} | $\frac{1}{2}$ IF susceptibility: | | | | | |
| | E2 to E13 | | 75 | – | – | dB μ V |
| | E14 to E69 | | 60 | – | – | dB μ V |
| m_x | cross modulation: | | | | | |
| | in-channel | | 65 | – | – | dB μ V |
| | in-band | | | | | |
| | low band ($n \pm 2$) | | 78 | – | – | dB μ V |
| | mid band ($n \pm 3$) | | 78 | – | – | dB μ V |
| high band ($n \pm 5$) | | 84 | – | – | dB μ V | |
| | out of band | | – | 100 | – | dB μ V |
| | breakthrough susceptibility: | | | | | |
| | channel 2 to 69 | | 60 | – | – | dB μ V |
| V_{osc} | oscillator voltage at all pins | | – | – | 70 | dB μ V |
| t_{li} | oscillators lock-in time | charge pump set logic HIGH | – | – | 150 | ms |
| α_{vs} | the video signal-to-sound interference ratio with the tuner exposed to sound signals in the audio frequency range 100 Hz to 10 kHz and sound pressure levels up to 105 dB (20 μ Pa) | | 40 | – | – | dB |
| | audio S/N ratio | | 40 | – | – | dB |
| V_{ESD} | electrostatic discharge (ESD) on all pins | note 1 | 2 | – | – | kV |

Desktop video & FM radio module system M, N

FM1236

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|--|------------------------------|------|------|------|------------|
| FM radio characteristics | | | | | | |
| α_{26} | limiting sensitivity for (S+N)/N | test signal C1 | – | 5 | 30 | dB μ V |
| α_{50} | | test signal C3 | – | 30 | 40 | dB μ V |
| | S/N ratio: mono at f = 22.5 kHz mono at f = 75 kHz stereo | test signal C1 | 55 | 58 | – | dB |
| | | | 65 | 68 | – | dB |
| | | test signal C3 | 55 | 63 | – | dB |
| $\alpha_{i(FM)}$ | FM image rejection | test signal C1 | 53 | 60 | – | dB |
| | effective selectivity S_{300} | test signal C1 + C2 | 50 | – | – | dB |
| | frequency response: lower –3 dB point upper –3 dB point | test signal C3; –3 dB points | – | 20 | 40 | Hz |
| | | | 14 | 18 | – | kHz |
| | AM suppression | test signal C1 | 38 | – | – | dB |
| | FM AF output level at terminal 20/21 (RMS value): mono stereo | test signal C1 | 40 | 57 | 74 | mV |
| | | test signal C3 | 120 | 175 | 230 | mV |
| | stereo separation | test signal C3; 1 kHz | 28 | 35 | – | dB |
| | total harmonic distortion: stereo at 1 kHz during overmodulation at f = ± 100 kHz | test signal C3 | – | 0.8 | 1.5 | % |
| | | | – | 1.5 | 3 | % |

Note

1. All the pins of the desktop video tuner are protected against electrostatic discharge (ESD) up to 2 kV. The product is classified in category B ("MIL-STD-883C").

Desktop video & FM radio module system M, N

FM1236

Video and audio characteristics (see Fig.2)

| PARAMETER | TEST SIGNAL | TEST POINT | MIN. | TYP. | MAX. | UNIT |
|--|------------------------------------|------------|------|------|------|------------|
| CVBS characteristics: | | | | | | |
| video amplitude signal at pin 23 | A1 (peak-to-peak value) | BU4 | 0.75 | 0.95 | 1.15 | V |
| DC level sync pulse at pin 23 | A1 | BU4 | – | 0.35 | – | V |
| Video amplitude drop with respect to modulation 1 MHz at $T_{amb} = 45\text{ }^{\circ}\text{C}$: | | | | | | |
| at 2 MHz | A1 | BU4 | –1.5 | – | +1.0 | dB |
| at 3 MHz | A1 | BU4 | –2.5 | – | +1.5 | dB |
| at 3.58 MHz | A1 | BU4 | –4.0 | – | +2.0 | dB |
| Sound carrier rejection | A1 (1 MHz) + B1 | BU4 | 40 | – | – | dB |
| Residual 47.25 MHz signal in video channel: level of 1.5 MHz | A1 + B3 | BU4 | – | – | 68 | dB μ V |
| Residual 91.5 MHz signal in video channel | A1 | BU4 | – | – | 80 | dB μ V |
| Second IF sound output level at level of 4.5 MHz | A1 (black) + B1 | BU5 | 84 | – | – | dB μ V |
| Test on 2T pulse at $T_{amb} = 45\text{ }^{\circ}\text{C}$: | | | | | | |
| 2T pulse/bar response | A1 | BU4 | –2.5 | – | +2.5 | % |
| 2T pulse response | A1 | BU4 | – | – | +3.0 | % |
| CVBS S/N (unweighted) | A1 + B1 | BU4 | 41 | – | – | dB |
| Gain limited sensitivity at 1 dB reduction of video output | A1 | BU4 | – | – | 30 | dB μ V |
| Maximum usable single input signal | A1 | BU4 | 90 | – | – | dB μ V |
| Audio characteristics: | | | | | | |
| AF output level measured via LP 200 kHz filter, RMS detector, 75 μ s de-emphasis | A1 + B2 | BU6 | 0.21 | 0.31 | 0.41 | V |
| THD (Total Harmonic Distortion) measured via LP 200 kHz filter, RMS detector, 75 μ s de-emphasis | A1 + B2 | BU6 | – | – | 0.5 | % |
| S/N measured via CCIR filter, peak CCIR detector, 75 μ s de-emphasis | A1 (full field colour bar) + B1 | BU6 | 38 | – | – | dB |
| AM suppression ratio | A1 (black) + B2 | BU6 | 40 | – | – | dB |
| Aerial input level for S/N = 41 dB | A1 (black) + B2 | BU6 | – | – | 45 | dB μ V |

Digital AFC status

ADC word at I²C-bus during read operation

| DIGITAL READ-OUT | FREQUENCY (kHz) |
|---------------------|--------------------|
| 00 | –125 |
| 01 | –62.5 |
| 02 | 0 |
| 03 | +62.5 |
| 04 | +125 |

Desktop video & FM radio module system M, N

FM1236

APPLICATION INFORMATION

A detailed description of the I²C-bus specification, with applications, is given in brochure "The I²C-bus and how to use it". This brochure may be ordered using the code number 9398 393 40011.

WRITE mode

| BYTE | BITS | | | | | | | | |
|----------------------------|----------|-----|-----|-----|-----|-----|-----|----------|------------------|
| | 7 MSB | 6 | 5 | 4 | 3 | 2 | 1 | 0 LSB | A ⁽¹⁾ |
| Address byte | 1 | 1 | 0 | 0 | 0 | MA1 | MA0 | 0 | A |
| Program divider byte 1 | 0 | n14 | n13 | n12 | n11 | n10 | n9 | n8 | A |
| Program divider byte 2 | n7 | n6 | n5 | n4 | n3 | n2 | n1 | n0 | A |
| Control information byte 1 | 1 | CP | T2 | T1 | T0 | RSA | RSB | OS | A |
| Control information byte 2 | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 | A |

Note

1. A = Acknowledge.

ADDRESS SELECTION

V_S = +5 V (PLL supply voltage)

| MA1 | MA0 | ADDRESS | VOLTAGE AT PIN 15 (see note 1) |
|-----|-----|---------|-------------------------------------|
| 0 | 0 | C0 | 0 to 0.1V _S |
| 0 | 1 | C2 | 0.2 to 0.3V _S |
| 1 | 0 | C4 | 0.4 to 0.6V _S |
| 1 | 1 | C6 | 0.9V _S to V _S |

Note

1. If the AS pin is left floating, the internal bias will automatically set the address to C2.

PROGRAMMABLE DIVIDER SETTINGS (BYTES 1 AND 2)

Divider ratio:

$N = 16 \times \{f_{RF(pc)} + f_{IF(pc)}\}$, where (pc) is picture carrier and f_{RF} and f_{IF} are expressed in MHz

$f_{osc} = N/16$ (MHz).

$N = (8192 \times n13) + (4096 \times n12) + (2048 \times n11) + (1024 \times n10) + (512 \times n9) + (256 \times n8) + (128 \times n7) + (64 \times n6) + (32 \times n5) + (16 \times n4) + (8 \times n3) + (4 \times n2) + (2 \times n1) + n0$

CONTROL BYTE

Charge pump settings:

CP = 1, for fast tuning

CP = 0, for moderate speed tuning with slightly better residual oscillator FM.

It is recommended to set CP = 1 at all times in the TV mode. In the FM radio mode, set CP = 1 only during the search tuning. Once the wanted channel is obtained, set CP = 0 to get the best signal-to-noise ratio.

Test mode settings:

T2 = T1 = 0; T0 = 1, for normal operation.

Desktop video & FM radio module system M, N

FM1236

PLL disabling:

OS = 0, for normal operation

OS = 1, for switching the charge pump to the high impedance state.

Ratio select bits

| RSA | RSB | STEP SIZE |
|-----|-----|-----------|
| X | 0 | 50 kHz |
| 0 | 1 | 31.25 kHz |
| 1 | 1 | 62.5 kHz |

PORTS BYTE

| FUNCTION | BIT | | | | | | | |
|------------------------------|-----|----|----|----|----|----|----|----|
| | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 |
| TV/FM bandswitching | | | | | | | | |
| FM band | 1 | 0 | 1 | 0 | | 1 | | |
| Low band | 1 | 0 | 1 | 0 | | 0 | | |
| Mid band | 1 | 0 | 0 | 1 | | 0 | | |
| High band | 0 | 0 | 1 | 1 | | 0 | | |
| TV mode | | | | | | | | |
| Power down mode; see note 1 | | | | | 0 | 0 | 0 | 1 |
| System M, N negative mode | | | | | 0 | 0 | 0 | 0 |
| FM radio mode | | | | | | | | |
| AFC; see note 2 | | | | | 0 | 1 | 0 | 1 |
| R _{IF} ; see note 3 | | | | | 0 | 1 | 0 | 0 |
| Mono | | | | | 0 | 1 | 1 | 0 |
| Mute | | | | | 1 | 1 | 0 | 0 |

Notes

1. If the TV function is not required, the tuner can be switched to power-down mode. In this mode the tuner reduces the current consumption by up to 100 mA.
2. By this setting the FM radio AFC status can be read from the A/D bits in the status byte.
3. By this setting the RF input level can be read from the A/D bits in the status byte.

Desktop video & FM radio module system M, N

FM1236

TELEGRAM EXAMPLES (WRITE MODE)

Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Cb - Ack - Pb - Ack - Stop.

Start - Adb - Ack - Cb - Ack - Pb - Ack - Db1 - Ack - Db2 - Ack - Stop.

Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Cb - Ack - Stop.

Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Stop.

Where:

Start = start condition

Adb = address byte

Ack = acknowledge

Db1 = divider byte 1

Db2 = divider byte 2

Cb = control byte

Pb = ports byte

Stop = stop condition.

READ mode

The in-lock can be read by setting the R/W bit to 1.

| BYTE | BITS | | | | | | | | |
|--------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| | 7 MSB | 6 | 5 | 4 | 3 | 2 | 1 | 0 LSB | A ⁽⁵⁾ |
| Address byte | 1 | 1 | 0 | 0 | 0 | MA1 | MA0 | 1 | A |
| Status byte | POR ⁽¹⁾ | FL ⁽²⁾ | I2 ⁽³⁾ | I1 ⁽³⁾ | I0 ⁽³⁾ | A2 ⁽⁴⁾ | A1 ⁽⁴⁾ | A0 ⁽⁴⁾ | A |

Notes

1. POR = Power On Reset. POR is internally set to 1 in case V_S drops below 3 V. The POR bit is reset when an end of data is detected by the PLL IC.
2. FL = In-lock flag; FL = 1: loop is phase-locked. The loop must be phase-locked during at least 8 periods of the internal reference frequency (either 7.8125 kHz, 3.90625 kHz or 6.25 kHz) before the FL flag is internally set to 1.
3. I2, I1 and I0 = digital information for I/O ports P2, P1 and P0 respectively.
4. A2, A1 and A0 = built-in 5-level A/D converter on the internal I/O port P6 (see Table "Digital AFC status").
5. A = Acknowledge.

TELEGRAM EXAMPLES (READ MODE)

Start - Adb - Ack - STB - Ack - STB - - Stop (no Ack from processor = End-of-data).

Start - Adb - Ack - STB - - Stop (no Ack from processor = End-of-data).

Where:

STB = Status byte.

Desktop video & FM radio module
system M, N

FM1236

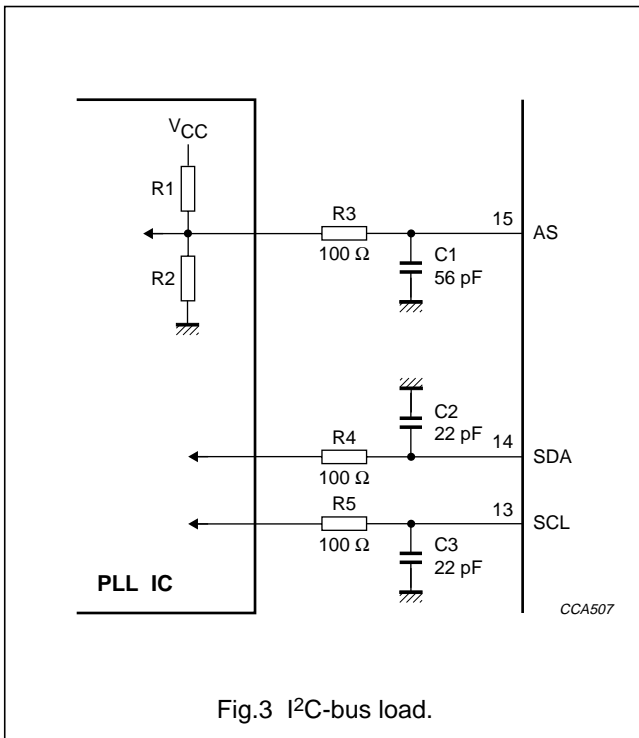


Fig.3 I²C-bus load.

Video buffer

A video buffer is built into the video module to enable the unit to drive a 75 Ω load directly.

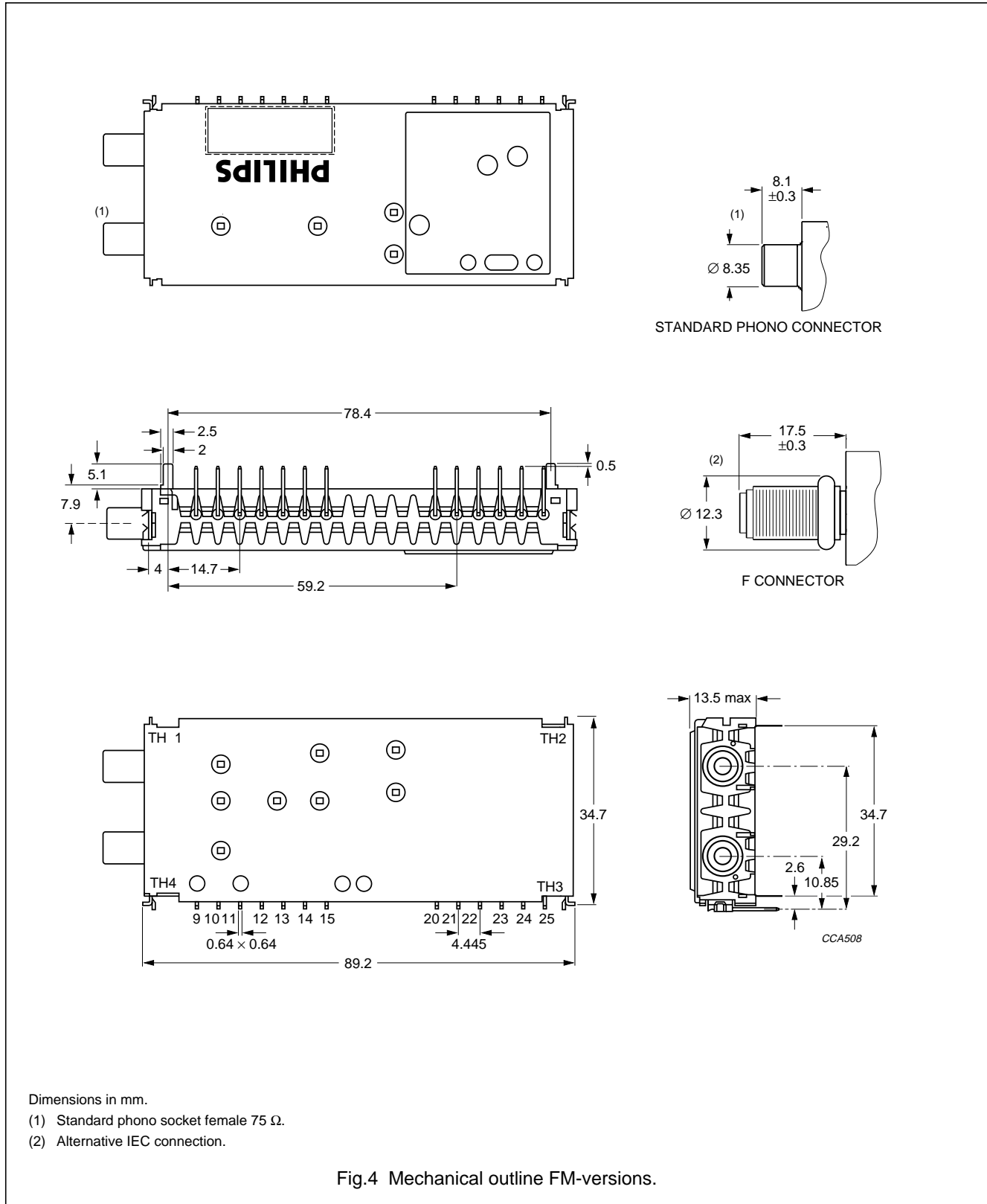
I²C-bus load

The FM1236 contains a series resistor ($R = 100 \Omega$) in the SCL and SDA lines. Both lines also have a capacitive load of typical 22 pF (see Fig.3).

Desktop video & FM radio module
system M, N

FM1236

MECHANICAL DATA



Dimensions in mm.

- (1) Standard phono socket female 75 Ω .
- (2) Alternative IEC connection.

Fig.4 Mechanical outline FM-versions.

Desktop video & FM radio module system M, N

FM1236

Aerial connections

Standard-phono socket female 75 Ω or F (female).

Solderability

The solderability of pins and mounting tags when tested initially and after 16 hours steam ageing in accordance with "IEC 68-2-20", test Ta, method 1 (solder bath 235 ±5 °C for 2 ±5 s), results in a wetted area of 95%. No de-wetting will occur when soldered at 260 ±5 °C for 5 ±0.5 s.

Resistance to soldering heat

The product will not be damaged when tested in accordance with "IEC 68-2-20", test Tb, method 1A (solder bath 260 ±5 °C for 5 ±1 s).

Mass

Approximately 50 g.

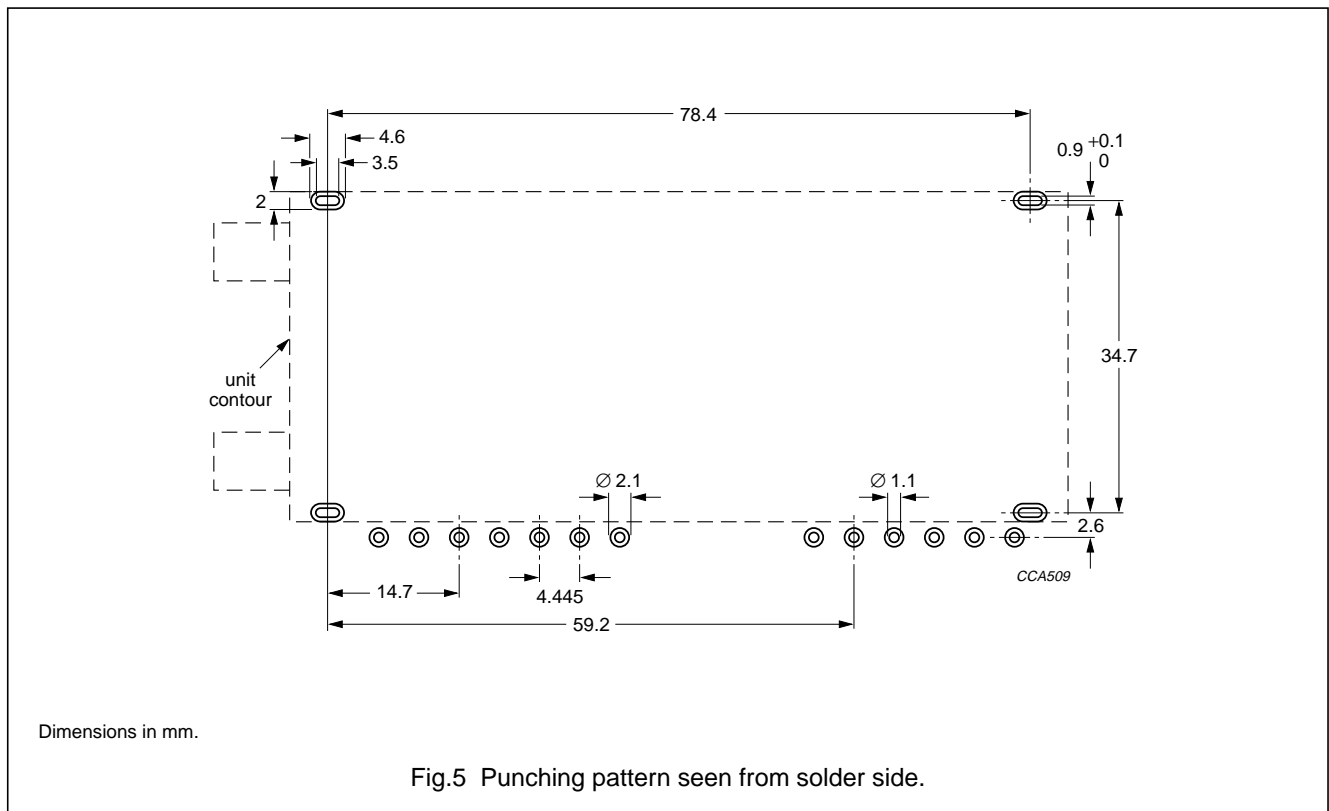
Robustness of pins

The pins will not be damaged when tested in accordance with "IEC 68-2-21" :

- Test Ua1, tensile of 20 N in axial direction
- Test Ua2, thrust of 4 N in axial direction
- Test Ua2, thrust of 2 N in axial direction.

Punching pattern of chassis PCB

Field rejects are often related to broken tag joints. Therefore, the following punching pattern is recommended (see Fig.5).



Desktop video & FM radio module system M, N

FM1236

DEFINITIONS

| Data sheet status | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

PURCHASE OF PHILIPS I²C COMPONENTS



Purchase of Philips I²C components conveys a license under the Philips' I²C patent to use the components in the I²C system provided the system conforms to the I²C specification defined by Philips. This specification can be ordered using the code 9398 393 40011.

Philips Components – a worldwide company

Argentina: Ierod, BUENOS AIRES,
Tel. (01) 786 7635, Fax. (01) 786 9397.

Australia: Philips Components Pty Ltd, NORTH RYDE,
Tel. (02) 9805 4455, Fax. (02) 9805 4466.

Austria: Österreichische Philips Industrie GmbH, WIEN,
Tel. (01) 601 01 12 41, Fax. (01) 60 101 12 11.

Belarus: Philips Office Belarus, MINSK,
Tel. (5172) 200 915, Fax. (5172) 200 773.

Benelux: Philips Nederland B.V., EINDHOVEN, NL.,
Tel. (+31 40) 2783 749, Fax. (+31 40) 2788 399.

Brazil: Philips Components, SÃO PAULO,
Tel. (011) 821 2333, Fax. (011) 829 1849.

Canada: Philips Electronics Ltd., SCARBOROUGH,
Tel. (0416) 292 5161, Fax. (0416) 754 6248.

China: Philips Company, SHANGHAI,
Tel. (021) 6485 0600, Fax. (021) 6485 5615.

Colombia: Iprenlenso Ltda, SANTAFE DE BOGOTA,
Tel. (01) 345 8713, Fax. (01) 345 8712.

Denmark: Philips Components A/S, COPENHAGEN S,
Tel. (32) 883 333, Fax. (31) 571 949.

Finland: Philips Components, ESPOO,
Tel. 9 (0)-615 800, Fax. 9 (0)-615 80510.

France: Philips Composants, SURESNES,
Tel. (01) 4099 6161, Fax. (01) 4099 6427.

Germany: Philips Components GmbH, HAMBURG,
Tel. (040) 2489-0, Fax. (040) 2489 1400.

Greece: Philips Hellas S.A., TAVROS,
Tel. (01) 4894 339/(01) 4894 239, Fax. (01) 4814 240.

Hong Kong: Philips Hong Kong, KOWLOON,
Tel. 2784 3000, Fax. 2784 3003.

India: Philips India Ltd., BOMBAY,
Tel. (022) 4938 541, Fax. (022) 4938 722.

Indonesia: P.T. Philips Development Corp., JAKARTA,
Tel. (021) 520 1122, Fax. (021) 520 5189.

Ireland: Philips Electronics (Ireland) Ltd., DUBLIN,
Tel. (01) 76 40 203, Fax. (01) 76 40 210.

Israel: Rapac Electronics Ltd., TEL AVIV,
Tel. (03) 6450 444, Fax. (03) 6491 007.

Italy: Philips Components S.r.l., MILANO,
Tel. (02) 6752 2531, Fax. (02) 6752 2557.

Japan: Philips Japan Ltd., TOKYO,
Tel. (03) 3740 5028, Fax. (03) 3740 0580.

Korea (Republic of): Philips Electronics (Korea) Ltd., SEOUL,
Tel. (02) 709 -1472, Fax. (02) 709 1480.

Malaysia: Philips Malaysia SDN Berhad
Components Division, PULAU PINANG,
Tel. (04) 657 055, Fax. (04) 656 5951.

Mexico: Philips Components, EL PASO, U.S.A.,
Tel. (915) 772 4020, Fax. (915) 772 4332.

New Zealand: Philips New Zealand Ltd., AUCKLAND,
Tel. (09) 849 4160, Fax. (09) 849 7811.

Norway: Norsk A/S Philips, OSLO,
Tel. (22) 74 8000, Fax. (22) 74 8341.

Pakistan: Philips Electrical Industries of Pakistan Ltd., KARACHI,
Tel. (021) 587 4641-49, Fax. (021) 577 035/587 4546.

Philippines: Philips Semiconductors Philippines Inc.,
METRO MANILA, Tel. (02) 816 6380, Fax. (02) 817 3474.

Poland: Philips Poland Sp. z.o.o., WARSZAWA,
Tel. (022) 612 2594, Fax. (022) 612 2327.

Portugal: Philips Portuguesa S.A.,
Philips Components: LINDA-A-VELHA,
Tel. (01) 416 3160/416 3333, Fax. (01) 416 3174/416 3366.

Russia: Philips Russia, MOSCOW,
Tel. (095) 247 9124, Fax. (095) 247 9132.

Singapore: Philips Singapore Pte Ltd., SINGAPORE,
Tel. 350 2000, Fax. 355 1758.

South Africa: S.A. Philips Pty Ltd., JOHANNESBURG,
Tel. (011) 470 5911, Fax. (011) 470 5494.

Spain: Philips Components, BARCELONA,
Tel. (93) 301 63 12, Fax. (93) 301 42 43.

Sweden: Philips Components AB, STOCKHOLM,
Tel. (+46) 8 632 2000, Fax. (+46) 8 632 2745.

Switzerland: Philips Components AG, ZÜRICH,
Tel. (01) 488 22 11, Fax. (01) 481 77 30.

Taiwan: Philips Taiwan Ltd., TAIPEI,
Tel. (02) 388 7666, Fax. (02) 382 4382.

Thailand: Philips Electronics (Thailand) Ltd., BANGKOK,
Tel. (02) 745 4090, Fax. (02) 398 0793.

Turkey: Türk Philips Ticaret A.S., GÜLTEPE/ISTANBUL,
Tel. (0212) 279 2770, Fax. (0212) 282 6707.

Ukraine: Philips Ukraine Ltd., KIEV,
Tel. (044) 268 7327, Fax. (044) 268 6323.

United Kingdom: Philips Components Ltd., DORKING,
Tel. (01306) 512 000, Fax. (01306) 512 345.

United States:

- Philips Components, JUPITER, FL,
Tel. (561) 745 3300, Fax. (561) 745 3600.
- For literature: (800) 447 3762.
- Display and Wire Wound Components, ANN ARBOR, MI,
Tel. (313) 996 9400, Fax. (313) 761 2776.

Uruguay: Philips Components, MONTEVIDEO,
Tel. (02) 704 044, Fax. (02) 920 601.

For all other countries apply to: Philips Components,
Marketing Communications, P.O. Box 218, 5600 MD EINDHOVEN,
The Netherlands, Fax. +31-40-2724 547.

COD09

© Philips Electronics N.V. 1997

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.
The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

Let's make things better.

**Philips
Components**



PHILIPS